REMARKS

Reconsideration of the above-identified patent application as amended herein is respectfully requested. Claims 1-19 are cancelled herein and replaced by new claims 20-31. Of these, claims 20 and 25 are independent. No new matter has been added.

IN THE DRAWINGS:

In the Office Action, the Examiner requested the submission of a drawing figure to facilitate the understanding of the invention. In addition, the Examiner objected to the internationally published figure because it failed to indicate the reference letter "L" and the reference number "14". Applicant submits herewith a proposed drawing figure corresponding to the internationally published figure for entry into this application to illustrate the invention. Fig. 1 illustrates the requested corrections in red ink. No new matter has been added.

IN THE SPECIFICATION:

In the Office Action, the Examiner objected to the Abstract of the Disclosure requesting the removal of the last sentence concerning the figure. Applicant submits herewith amendments to the Abstract of the Disclosure to remove the last sentence and to reflect the invention claimed herein. No new matter has been added.

In addition, the Examiner objected to the disclosure because of certain informalities. Applicant submits herewith a substitute specification in two copies, one clean copy and one marked up copy, to show the changes made to correct the

informalities as requested in the Office Action. In addition, section headings have been added to the specification. No new matter has been added.

IN THE CLAIMS:

In the Office Action of October 3, 2002, the Examiner rejected claims 2, 4, 14, 6, 15, 8, 10, and 17-19 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 1, 2, 4, 8, 13, 14, 15, 8, 10, and 17-19 are cancelled herein and replaced by new claims 20-31 and which have been drafted with consideration to the informalities noted in the Office Action. In the table below, the correspondence between claims 20-31 and the original claims is shown.

Correspondence Table

Claim No.	Original Claim
20	1 + 13
21	2
22	15
23	4
24	14
25	16
26	19

27	New
28	17
29	10
30	8
31	18

In addition, Applicant respectfully points out that claim 6 was previously canceled and replaced with claim 15 in a preliminary amendment filed on March 7, 2001, concurrently with the instant application. Therefore, the withdrawal of the rejections of claims 2, 4, 14, 15, 8, 10, and 17-19 under 35 U.S.C. 112, second paragraph, is respectfully requested.

Applicant gratefully acknowledges the Examiner's indication that the claims contain allowable subject matter. In order to satisfy the duty of disclosure, Applicant submits herewith a Supplemental Information Disclosure Statement, a PTO 1449 form and the two references McLoughlin et al. (US Patent 5,590,719) and Lauderback et al (U.S. Patent 2,928,611) listen on the PTO 1449 form. The two references were cited respectively during the examination of the European Patent Application and the German priority application which corresponds to the instant application. The following arguments distinguish the presently claimed invention from the state of the art.

The presently claimed invention is directed to a method and a device for fighting fires, in which a jet of extinguishing foam produced by the firefighting apparatus is

directed toward the source of a fire, so as to cover the source of the fire. The method consists in supplementing the jet of extinguisher foam with a mist of firefighting liquid discharged in the form of several individual jets whose respective origins are in direct proximity with the origin of the jet of extinguisher foam.

The individual jets of firefighting mist are designed to cool down the space surrounding the source of a fire in order to prevent the spreading of the fire in the surrounding area. The discharge of the liquid mist in the form of individual jets permits, in a simple way, to surround the section of the fire which is currently covered by the jet of the extinguisher foam.

New claim 20 recites:

"A method for fighting a fire comprising:

directing a jet of extinguisher foam ...toward a source of the fire; and

...in addition to the jet of extinguisher foam, discharging a mist of firefighting liquid onto a region surrounding the source of the fire to cool down this region, wherein said mist of firefighting liquid comprises individual jets whose respective origins on the firefighting apparatus are in direct proximity to the origin of the jet of the extinguisher foam."

The presently claimed invention is also directed to a device to implement the claimed method. Such device comprises an extinguisher nozzle head which comprises (a) an extinguisher foam generating device for generating a directional jet of extinguisher foam and (b) additional extinguisher nozzles. At least one of such nozzles is aligned so

that the jet of mist of firefighting liquid emanating from it is directed toward the source of the fire, while at least one further nozzle of firefighting mist is aligned such that the jet of mist emanating from it is perpendicular to the direction of exit of the jet of extinguisher foam. The device is claimed in new independent claim 25 as follows:

"A device for fighting a fire comprising:

an extinguisher nozzle head with an extinguisher foam generating device for generating a jet of extinguisher foam, wherein the extinguisher nozzle head further comprises additional extinguisher nozzles for generating jets of mist of firefighting liquid."

McLoughlin et al. discloses a firefighting nozzle capable of discharging a variable solid stream and a variable fog spray. The nozzle comprises an annular fog spray opening concentrically surrounding a jet orifice for discharging a circular, solid stream of liquid. A plurality of inwardly curved, forwardly projecting teeth are formed within the fog spray opening, along the circumference, directing the flow in all directions and creating a conical "fog" of evenly distributed droplets.

Thus, those teeth split the annular solid stream of liquid into a plurality of solid portions exiting from the nozzle in conical shape and surrounding the centrally emitted stream of extinguishing foam. By this means disclosed by McLoughlin, it is possible to apply to a source of a fire a foam simultaneously surrounded by a jet of extinguishing fluid.

However, the method of McLoughlin does not disclose or teach"**...a jet of extinguisher foam ...toward a source of the fire ...mist of firefighting liquid onto a region surrounding the source of the fire to cool down this region, wherein said mist of firefighting liquid comprises individual jets**" as claimed in new claim 20. Rather, McLoughlin teaches a chamber from which a **single**, annular solid stream is produced and split into a plurality of solid stream portions by the teeth. The mist comes into existence only by impingement of these portions with each other and not by the production of the nozzle itself as in the presently claimed invention.

In addition, the dispersed droplets produced by the method of McLoughlin must be coarse, due to the fact that the mist is produced merely by the impingement of solid streams with each other after having left the nozzle. Accordingly, the extinguishing effectiveness of the mist in combination with the extinguishing foam is rather low.

In contrast, new claims 20 and 25 claim a method and a device to implement the method in which the extinguishing mist supplements the extinguisher foam by cooling to a great extent the space surrounding the fire, thus inhibiting spontaneous combustion by stalling the oxygen-supply to the fire source.

McLoughlin et al. does not consider that aspect. Rather, the reference refers to the advantage of the mist as merely to cool the flames within **the immediate vicinity of the firefighter** to protect him from excessive heat. Accordingly, a fire could be extinguished either by a solid stream combined with the mist of by the extinguisher foam. The possibility of supporting the extinguishing capability of an extinguisher foam with a

supplement of an extinguisher mist is not disclosed in McLoughlin et al. Consequently, the effectiveness of the extinguisher mist of McLoughlin et al. is substantially inferior to that claimed in new clams 20 and 25. Only if the extinguishing mist is produced by every individual jet nozzle, with the respective origin indirect proximity to the origin of the jet of extinguisher foam is possible to achieve a remarkable enhancement of the extinguishing capabilities. By providing for nozzles specialized for this purpose, new claims 20 and 25 claim an extinguishing liquid leaving the nozzles already in the form of a finely dispersed mist which will be carried into the surrounding space contributing most effectively to firefighting.

As the purpose of the mist in the McLoughlin reference differs from that of the instant application, it would not be obvious to modify the method and apparatus of McLoughlin et al. to arrive at the claimed invention without the benefit of hindsight.

Thus, McLoughlin et al. does not render obvious the teaching of new claims 20 and 25.

Lauderback et al. disclose a fire hose with a head axially movable. In the head, there are 12 nozzle holes arranged in a way so that the extinguishing fluid stream discharged out of these holes are directed toward a center of impingement, where the fluid streams collide and break into a fine mist or fog. In addition, the presence of the holes enables the fire hose nozzle to be used for the production of foam. By adding a foaming agent to the extinguishing liquid, the impingement of the streams discharged through the nozzles produce a fine dispersed foam which uniformly fills the space

surrounded by a liquid stream. This liquid stream exits through a ring-like gap, which, depending on the axial position of the head, surrounds the head. But since the nozzle heads and the ring-like gap are fed by the same fluid source, the foam agent-containing fluid is discharged not only through the nozzle heads, but also through the ring-like gap.

Accordingly, the device of Lauderback et al. does not allow the discharge of **"extinguisher foam"** and a **"mist of firefighting liquid"** as required in new claims 20 and 25.

Thus, it is submitted that the Lauderback et al. reference does not render unpatentable new claims 20 and 25.

In addition, since neither Emmons (US Patent 3,684,019) nor Pulver et al. (US 2,527,891) nor Kamat-Pumpen (DE 295 18 911), all cited in the Information Disclosure Statement filed on June 18, 2001, do not mention the application of foam but rather disclose fighting fires with extinguishing liquid fog, none of the prior art cited, alone or in combination, suggest to a person skilled in the art the method and apparatus of new claims 20 and 25.

In light of the foregoing amendment and arguments, the application is now believed to be in proper form for allowance of all claims and a notice to that effect is earnestly solicited.

Please deduct any fees resulting from this Amendment from deposit account number 16-2500 of the undersigned.

The undersigned attorney requests that the Examiner contact him at the telephone number indicated below if it would help expedite prosecution of this application.

Respectfully submitted,
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By _____
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Enclosure: Clean Version of the Substitute Specification; Marked up Version of the Substitute Specification; Supplemental Information Disclosure Statement; PTO 1449; 2 References; Proposed Drawing Figure; Petition for a Three Month Extension of Time.

MARKED UP VERSION OF THE SUBSTITUTE SPECIFICATION

A METHOD AND A DEVICE FOR FIREFIGHTING

Background of the invention

The invention relates to a method and a device for firefighting, in which a directed jet of extinguisher foam is applied so as to cover the source of the fire. Furthermore, the invention relates to a device which is suitable for implementing the method. Such devices are used in stationary or mobile firefighting units, to suffocate a fire by means of foam, for example if the use of water as a firefighting liquid is not possible.

Description of the Prior Art

A device suitable for firefighting with extinguisher foam is known from the British printed patent specification 1 018 431. The device described in this printed publication comprises a foam tube, a cylindrical section of which encompasses a nozzle body. The nozzle body comprises a nozzle through which firefighting liquid is applied. To let in the surrounding medium, the known device has an entry aperture at the rear. In addition, several entry apertures are arranged on the cylindrical circumference of the foam tube.

The extinguisher foam generated by means of such a device can be applied in a directional jet. This provides the advantage that the extinguisher foam exits at relatively high kinetic energy thus providing considerable reach. The fire can therefore first be fought from a great

distance and subsequently from a lesser distance. At the same time the concentrated application of the jet of extinguisher foam causes the foam to impact on the location of the fire in compact form, forming a thick cover after impact, which cover suffocates the fire.

The strong concentration of the jet of extinguisher foam, which is desirable in view of the ability to cover a long range and achieve good effectiveness of the extinguisher foam, is however problematic in practical applications where fires have to be fought which have spread across large areas or which have established themselves in a substantial, compacted volume such as for example in a stack of wood or paper. Such fires can be fought by a directional jet of extinguisher foam only in that the nozzle is moved to and for during firefighting. As a result of this movement, the jet washes over the surface of the fire, covering it with extinguisher foam after a period of time. Practice shows however that due to the lack of sealing off of the fire and the increased ambient temperature, the spread of the fire to adjacent regions and objects cannot always be prevented.

Objects of the Invention

It is thus the object of the invention to provide a method of the type described in the introduction and a suitable device for carrying out this method, which make it possible to extinguish fires which are spreading in area, while at the same time reducing the risk of the fire spreading.

Concerning the method, this object is met in that as a supplement to the jet of extinguisher foam, a mist of firefighting liquid is discharged which cools down the space surrounding the source of the fire.

Summary of the Invention

The method according to the invention combines the firefighting method which is known per se for example from the German utility model 295 18 911.8, using firefighting mist, with the method of firefighting by means of an extinguisher foam. It has been shown that the firefighting mist and the jet of extinguisher foam ideally complement each other, in particular when fighting large-area or large -volume fires. This happens in that as a result of the directional extinguisher jet, the fire is fought directly and the top surface of the fire is gradually covered up with foam. Furthermore, the firefighting mist cools down the gas space which surrounds the fire. Since the firefighting mist covers a significantly larger space than does the jet of extinguisher foam, the application of the firefighting mist results in a lowering of the ambient temperature of the fire also in those regions where direct coverage of the fire by extinguisher foam has not yet taken place, i.e. if the fire in these particular areas is still burning. This prevents the fire from spreading, for example by spontaneous combustion of objects adjacent to the source of the fire, due to the high temperatures in the surroundings of the fire.

It is particularly advantageous if application of the firefighting mist optionally depends on the position of a

control device. This makes it possible to match the composition of the firefighting agents (extinguisher foam / mist of firefighting liquid) applied to the region of the source of the fire, to the particular fire situation.

The foam tube can be used particularly advantageously in conjunction with firefighting appliances where the firefighting liquid is applied at high pressure, i.e. at pressures above 40 bar.

A further advantageous embodiment of the method according to the invention is characterized in that a mist of firefighting liquid is applied in the form of several individual jets whose respective origin is in direct proximity to the origin of the jet of extinguisher fluid. Thus it can be ensured in a simple way that most of the mist of firefighting liquid surrounds that section of the fire which is currently covered by the jet of extinguisher foam. For this reason, this embodiment is in particular advantageous in those cases where the method according to the invention is implemented by way of a mobile firefighting appliance in which the firefighter holds a mobile firefighting pistol in his/her hand. In this context it is particularly favourable if part of the individual jets of the mist of firefighting liquid is directed in the direction of the source of the fire, while another part is directed in the perpendicular way, aligned with the axis of the jet of extinguisher foam. In this way, an extended volume of space is filled with the mist of the liquid so that it is not only the space in the immediate vicinity of the fire but also the exhaust gasses rising in the surroundings, that are cooled. It is also favourable if, as a supplement or as an alternative,

at least one individual jet is directed in a direction pointing away from the source of the fire so that the rear space too, of the firefighting appliance is sure to be covered by the firefighting mist.

Practical trials have shown that the method according to the invention can be used particularly effectively if the firefighting liquid from which the mist of firefighting liquid is made, is water.

A device which is particularly suitable for implementing the method according to the invention, said device comprising an extinguisher nozzle head which comprises an extinguisher foam generating device for generating a directional jet of extinguisher foam, is characterized according to the invention by the extinguisher nozzle head comprising additional extinguisher nozzles for generating jets of mist of firefighting liquid. In this, preferably at least one of the extinguisher nozzles can be aligned such that the jet of mist of firefighting liquid emanating from it, is directed in the direction of the source of the fire, while at least one further nozzle of firefighting mist is aligned such that the jet of mist of firefighting equipment emanating from it emanates in a direction aligned perpendicularly in relation to the direction of exit of the jet of extinguisher foam.

Further embodiments of the invention are stated in the dependent claims; in the following description of one embodiment they are explained in more detail by means of a drawing.

Brief Description of the Drawings

~~The only figure~~ Figure 1 shows a transportable firefighting pistol L in partial lateral-section view.

Detailed Description of the Preferred Embodiments

The extinguisher nozzle head 1 of the transportable firefighting pistol L is constructed so as to be rotation-symmetrical and at its front comprises a front surface 2. In the centre of the front surface 2, a central extinguisher nozzle 3 is arranged. The central extinguisher nozzle 3 is connected to a first supply line 4 of the firefighting pistol L, said supply line being routed in the tubular housing R of the firefighting pistol L.

Shaped to the front surface 2 of the extinguisher nozzle head 1 is a rotary bevelled surface 5 which recedes at an angle α of approximately 45° in relation to the front surface 2. Extinguisher nozzles 6 are arranged on the bevelled surface 54, said extinguisher nozzles being connected to a second supply line 7 of the firefighting pistol L, which supply line 7 is also routed inside the tubular housing R. The extinguisher nozzles 6 are arranged, at regular angular spacings, on a circle which is arranged concentrically to the aperture of the central extinguisher nozzle 3. The direction of exit of the jet of mist emanating from them if firefighting liquid is applied, is essentially at a right angle to the bevelled surface 5. Consequently, the jets of mist of the extinguisher nozzles 5 are essentially directed in the same direction as the jet which emanates parallel to the

longitudinal axis X of the extinguisher nozzle head 1 which is generated by the central extinguisher nozzle 3.

By way of a manually adjustable valve V, firefighting liquid can be supplied to the supply lines 4, 7, either together or individually. Adjacent to the bevelled surface 5 is a radially surrounding casing surface 8 whose axis extends parallel to the longitudinal axis X of the extinguisher nozzle head 1, with further extinguisher nozzles 9, connected to the supply line 7, being arranged on said casing surface. When firefighting liquid is applied to the extinguisher nozzles 9, they also produce a jet of firefighting mist. However, this jet incorporates a component aligned radially to the longitudinal axis X of the extinguisher nozzle head 1 and a component aligned in the direction of the valve V, so that the jets of firefighting mist emanating from the extinguisher nozzles 9 cover the space surrounding the firefighting pistol L rearward and laterally.

On the central extinguisher nozzle 3 a foam tube 11 is attached via a sleeve 10. The foam tube 11 comprises a nozzle body 12 with an injector nozzle 13 projecting into the foam tube 11. The borehole 14 of the injector nozzle 13 is connected to the central extinguisher nozzle 3 via a chamber of the nozzle body 12~~11~~ and the sleeve 10. Between the wall of the foam tube 11 and the nozzle body 12 there are entry apertures (not shown) through which surrounding air is sucked into the foam tube.

Depending on the position of the valve V, firefighting liquid, preferably water, is supplied to the supply lines 4 or 7, either together or individually. In both supply

lines the pressure of the firefighting liquid is in excess of 40 bar. When applying pressure to the supply line 4, the extinguisher nozzles 6 and 9 create a firefighting mist where the individual droplets of liquid are of small volume and issue from the nozzle openings of the extinguisher nozzles 6, 9 into the surroundings finely distributed and at high kinetic energy. The jets of mist emanating from the extinguisher nozzles 6 pointing forward at an angle reach the surroundings of the source of the fire where by evaporation and by accompanying displacement of the oxygen they cool down the gases that are present there. By contrast, the jets emanating from the extinguisher nozzles 9 of the casing surface 8 fill the lateral and rearward space with firefighting mist, so that there too, an efficient reduction in temperature is achieved. This not only prevents the fire from spreading to the cooled-down area, but at the same time it also protects firefighting personnel operating the firefighting pistol.

When pressure is applied to the supply line 7, from the central extinguisher nozzle 3~~4~~, a directional jet of firefighting liquid mixed with a foam-generating additive, is discharged at high pressure from the central extinguisher nozzle 3. This jet enters the chamber of the nozzle body 12 ~~of the jet pipe 11~~ where it is additionally swirled. By way of injector nozzle ~~opening~~ 13, the jet of firefighting liquid swirled in this way enters the foam tube 11 into which it sucks up air via the entry apertures of the foam tube, according to the venturi effect. This air mixes with the fine mist of firefighting liquid, creating a fine-pore foam. This foam emanates from the foam tube 11 at high kinetic energy and

reaches the source of the fire as a directional, compact jet of extinguisher foam.

The combined action of covering the source of the fire by means of the directional jet of extinguisher foam and cooling the space surrounding the source of the fire by means of the mist of firefighting liquid, considerably reduces the danger of the fire spreading to regions or objects adjacent to the source of the fire. Likewise, lowering of the surrounding temperature reduces the exposure of and danger to, firefighting personnel during firefighting.

To carry out the method according to the invention, preferably water is used as a firefighting liquid. Water mist provides advantages as a result of its excellent thermal binding and inerting properties which, together with the protection from radiated heat which it affords to operating personnel, increase the effectiveness and usefulness of the foam generated by the high pressure foam generator located on the central jet.

It must be pointed out in particular that the foam tube 1112 brings about a considerable improvement in the reach of the jet of firefighting agent emanating from it, if no foam-generating additive has been admixed to the firefighting agent, but instead if only the mist of firefighting liquid itself emanates from the foam tube 1112 as a jet of high kinetic energy. The use of the foam tube 1112 when using liquid without any foam-generating additive, is favourable in those cases when for example, a directional jet of firefighting liquid is required to reach the source of the fire from a considerable

distance. Furthermore, the jet of firefighting liquid concentrated by the foam tube 11, can be used to wet hot spots situated deep inside the source of the fire, by applying a well-aimed jet.

List of references

Firefighting pistol L
Extinguisher nozzle head 1
Front surface 2
Central extinguisher nozzle 3
Supply line 4
Tubular housing R
Bevelled surface 5
Angle a
Extinguisher nozzles 6
Supply line 7
Longitudinal axis X
Control device V
Casing surface 8
Extinguisher nozzles 9
Sleeve 10
Foam tube 11
Nozzle body 12
Injector nozzle 13
Borehole 14

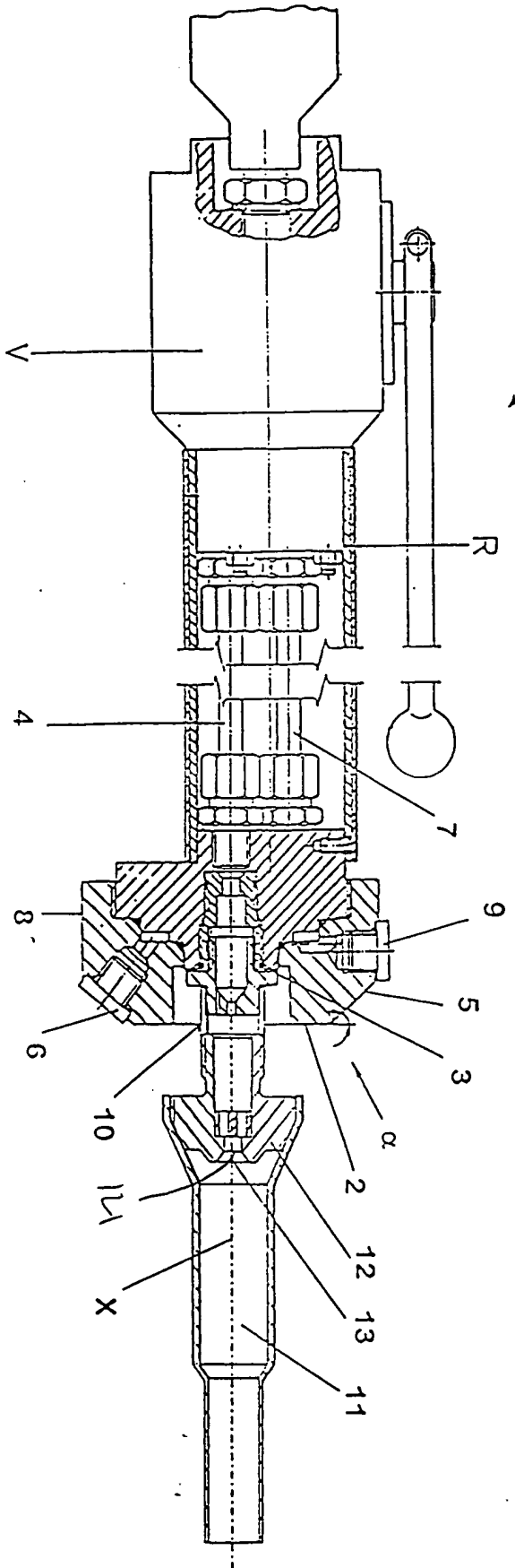

Fig 1

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